Bacteriology[5] has encouraged the author to prepare the fourth edition, which is a thorough revision of the third. The work is divided into three parts; first, the structure, form, physiology and methods of study of bacteria in general; second, the contamination and fermentation of milk, and the proper means of milk preservation; third, the relation of bacteria to milk products, as concerns both their desirable and undesirable effects.

The work is excellent in that it makes practical application of so much of the purely scientific work of bacteriology. It furnishes a further testimony to the mutual relation existing between research and practice. It seems, however, that the book should contain figures of those bacteria found in connection with dairying, which induce not only unfavorable conditions in milk, but also of those which induce diseases of men, since illustrations would better enable students of dairying to identify such organisms when present. It is quite noticeable that so important a work as the *Manual of Bacteriology* by Muir and Ritchie should be omitted from the author's list of works which "contain more or less complete descriptions of the various processes employed in studying bacteriology."

As a text upon dairy bacteriology the book fills a place not approached by any other work, as shown by the fact that it is now used in all the dairy schools of the United States and Canada. In addition to the interest in the book on the part of students of such schools, the subject is of so much importance to all users of milk and its products, and the book is so excellently written that it should be extensively recommended to all as a study in public hygiene. —Otis W. Caldwell.

NOTES FOR STUDENTS.

Fascicles III and IV of the *Fungi Rossiæ Exsiccatæ* contain a number of interesting Uredineæ collected by Mr. Komarov in Mantchuria, and included because the flora is similar to that of some of the Russian provinces. As the plants of that region are so closely related to those of eastern America, it was to be expected that some of our parasitic fungi would occur there. Accordingly we find *Puccinia Waldsteiniæ* Curt.; *P. haleniæ* Arth. & Halway, hitherto only known from northern Minnesota; a variety of *P. heucheræ* (Schw.) Diet.; *P. mesomegala* Berk. & Curt.; *Æcidium Sambuci* Schw.; and *Uromyces lespedegæ* (Schw.) Pk.—E. W. D. H.

The February number of *Natural Science* is an interesting, if not in all instances a gratifying, one to students of ecology, containing, among other things, papers on the study of plant associations by Robert Smith, mimetic resemblances in animals and plants by Professor Henslow, and bees and the origin of flowers by G. W. Bulman. The first is chiefly interesting because

[5] Russell, H. L.: Outlines of dairy bacteriology. 4th ed. pp. vi + 190. *figs.* 39. The Author, Madison, Wis., 1899.

of an analysis of the earlier treatment of plant formations or associations; Professor Henslow concludes, after an employment of the expressions "mimicry" and "mimetic," which is rather different from that usual with naturalists, that "natural selection is quite uncalled for, and, in fact, has no *raison d'être* in the origin of any structure whatever;" and Mr. Bulman reaches the conclusion that the theory of the origin of flowers by the selective action of insects, "as taught by Darwin, Wallace, Hermann Müller, Sir John Lubbock, and Mr. Grant Allen, is absolutely incompatible with the facts of the mutual relations of insects and flowers."—W. T.

IN A PAPER[6] reviewed in an earlier number of this journal,[7] Oltmanns claimed to have disproved the earlier work of Berthold,[8] according to which, in *Ectocarpus siliculosus*, a quiescent female gamete becomes attached to several male gametes, with which it is said to fuse. Basing his conclusions upon a study of *E. criniger*, Oltmanns claimed that Berthold saw, not fusing gametes, but infusoria capturing and eating the algal zoospores. Berthold replied immmediately,[9] insisting that his preparations were not susceptible of any interpretation other than the one he had already given.

Recent work by Oltmanns[10] upon *E. siliculosus* has led him to abandon his former position, and to confirm the statements of Berthold. He indeed finds infusoria, as before, but he also finds gametes fusing, and described the process quite fully.

Several male gametes become attached to the female by their long anterior cilia; finally one is drawn nearer, and fusion follows. In material collected in the morning this generally occurs before noon, and nuclear fusion is usually completed before night. The fusion of the female with more than one male gamete is very rare, but the author does not tell us of the fate of the second male nucleus when this occurs. The second chromatosphere of the normal zygote is said to persist.

We may then say that the Ecocapaceæ show sexual conditions in all stages of transition from isogamy, through such forms as *Ectocarpus siliculosus*, in which there is hardly more than a physiological differentiation of the gametes, to the distinct heterogamy of *E. secundus*, in which, according to Sauvageau, the two gametes differ considerably in size.

The "neutral" swarm-spores which are almost always associated with the gametes in the plurilocular sporangia, arise secondarily by the failure of sexual fusion, and therefore do not stand in a close phylogenetic relation to the swarm-spores of the unilocular sporangia.—W. D. MERRELL.

[6] Flora **83**: 398–414. 1887.

[7] BOT. GAZ. **24**: 383–384. 1897.

[8] Mittheil. d. zool. Stat. Neapel **2**: 401. 1881.

[9] Flora **83**: 415–425. 1897.

[10] Ueber die Sexualität der Ectocarpeen. Flora **86**: 86–99. 1899.